

CLAIMS

- 1 1. A pinch valve comprising:
2 a housing that encloses a flexible tube;
3 a first pinch element and a second pinch element, each being oriented on a re-
4 spective axis of rotation transverse to an axis of extension of the tube, each of the first
5 pinch element and the second pinch element being constructed and arranged to rotate
6 with respect to each other between a fully closed and a fully open position; and
7 wherein each pinch element respectively defines a pinch region that confronts an
8 outer wall of the tube to define a profile that surrounds substantially the outer perimeter
9 of the tube, the pinch region varying about a circumference of each of the first pinch ele-
10 ment and the second pinch element between (a) the fully open position in which the pro-
11 file conforms to a shape of an outer perimeter of the tube in an unpinched state, through
12 (b) a continuous ramping surface in which the profile at various points around the cir-
13 cumference defines, for pinching the tube, progressively from a shortened flattened seg-
14 ment at large depth with respect to the axis of extension and large-radius filleted ends to a
15 lengthened flattened segment of small depth with respect to the axis of extension and
16 small-radius filleted ends to (c) the fully closed, position in which the profile defines, a
17 maximum length flattened segment at minimum depth with respect to the axis of exten-
18 sion and minimum-radius filleted ends, whereby the tube is substantially engaged along
19 substantially the outer perimeter by the pinch region at all circumferential positions of the
20 pinch elements.
- 1 2. The pinch valve as set forth in claim 1 the first pinch element is constructed and
2 arranged to counter-rotate with respect to the second pinch element.
- 1 3. The pinch valve as set forth in claim 2 wherein the first pinch element includes a
2 first and the second pinch element includes a second gear and wherein the first gear en-
3 gages the second gear to cause the first pinch element to rotate in response to rotation of
4 the second pinch element.

- 1 4. The pinch valve as set forth in claim 2 wherein the tube is fixedly attached into
2 the housing and the housing includes end connectors for interconnecting with a fluid
3 system.
- 1 5. The pinch valve as set forth in claim 4 wherein the housing includes a first flared
2 end and a second flared end, the tube includes a first shaped end that conforms to the first
3 flared end and a second shaped end that conforms to the second flared end, a first sealed
4 end cap with a first end connector engaging the first flared end and a second sealed end
5 cap with a second end connector engaging the second flared end.
- 1 6. The pinch valve as set forth in claim 1 wherein the first pinch element and the
2 second pinch element each include cylindrical top and bottom sections that respectively
3 bound the pinch region.
- 1 7. The pinch valve as set forth in claim 6 wherein the housing includes wells for re-
2 ceiving the cylindrical top and bottom sections to restrain the pinch elements against lat-
3 eral movement during rotation.
- 1 8. A pinch valve comprising:
2 a housing that encloses a flexible tube;
3 a first pinch element and a second pinch element, each being oriented on a respective axis
4 of rotation transverse to an axis of extension of the tube, each of the first pinch element
5 and the second pinch element being constructed and arranged to counter-rotate with re-
6 spect to each other between a fully closed and a fully open position; and
7 wherein each of the first pinch element and the second pinch element define one
8 half of a profile that ranges along a circumference of rotation from a fully open shape in
9 which the tube is unpinched to a fully closed shape, in which the tube is fully pinched
10 together and wherein the profile, at all times through rotation from the fully open shape to
11 the fully closed shape engages substantially an entire outer perimeter of the tube to force
12 the tube to remain in the desired shape.

1 9. The pinch valve as set forth in claim 8 wherein the pinch region varies about the
2 circumference of each of the first pinch element and the second pinch element between
3 (a) the fully open position in which the profile conforms to a shape of an outer perimeter
4 of the tube in an unpinched state, through (b) a continuous ramping surface in which the
5 profile at various points around the circumference defines, for pinching the tube, progres-
6 sively from a shortened flattened segment at large depth with respect to the axis of exten-
7 sion and large-radius filleted ends to a lengthened flattened segment of small depth with
8 respect to the axis of extension and small-radius filleted ends to (c) the fully closed, po-
9 sition in which the profile defines, a maximum length flattened segment at minimum
10 depth with respect to the axis of extension and minimum-radius filleted ends